Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal Form

Section 1. General administrative information

Evaluate Rebuilding the White Sturgeon Population in the Upper Snake River Basin

---

Bonneville project number, if an ongoing project 9700900

Business name of agency, institution or organization requesting funding

Nez Perce Tribe
Department of Fisheries Resource Management

Business acronym (if appropriate) NPT

Proposal contact person or principal investigator:

Name	Paul Kucera
Mailing Address	NPT Dept. Fisheries Resource Management P.O. Box 365
City, ST Zip	Lapwai, ID 83540
Phone	(208) 843-7320
Fax	(208) 843-7322
Email address	paulk@nezperce.org

Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
N/A			

NPPC Program Measure Number(s) which this project addresses.

NPPC Program Measure Number **10.4A.4**

Measure 10.4A.4 calls for Bonneville Power Administration to "...fund an evaluation (including a Biological Risk Assessment, see Sec. 7.3B.1) of potential means of rebuilding the sturgeon population between Lower Granite and Hells Canyon dams."

NMFS Biological Opinion Number(s) which this project addresses.

N/A

Other planning document references.

Multi-Year Implementation Plan for Resident Fish Protection, Enhancement and Mitigation in the Columbia River Basin (CBFWA 1997)

Section 6.6.5.1.A calls for the restoration of white sturgeon in the Lower Snake Subregion

Subbasin.

Lower Snake Subbasin

Short description.

Evaluate the need for and identify potential measures to protect and restore the population and mitigate for effects of the hydropower system on the productivity of Snake River white sturgeon between Hells Canyon and Lower Granite dams to obtain a sustainable annual subsistence harvest of white sturgeon by the Nez Perce People equivalent to 5 kg/ha/yr.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
	Anadromous fish		Construction		Watershed
x	Resident fish		O & M		Biodiversity/genetics
	Wildlife		Production	x	Population dynamics
	Oceans/estuaries	x	Research		Ecosystems
	Climate		Monitoring/eval.		Flow/survival
	Other		Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat enhancement/restoration
			Acquisitions		

Other keywords.

Enhancement / Restoration

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
8605000	Evaluation of White Sturgeon in the Columbia River	In 1995 and 1996- NPT White Sturgeon BPA Project # 9700900 was subcontracted under Project # 8605000.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Evaluate the need and identify potential actions for protecting and restoring populations to mitigate for effects of hydropower on white sturgeon productivity.	a.	Conduct a biological risk assessment: a) identifying potential mitigative actions needed, b) assessing risks and uncertainties that may result from implementation, and c) identifying and developing a plan to collect the information needed to fully assess risks.
2	Assess the current status of the Snake River White Sturgeon population between Hells Canyon and Lower Granite dams.	a.	Assess health and status of population: a) estimate abundance and determine structure of the population, and b) collect population data for modeling production and viability of the population.
		b.	Define habitat use for spawning and rearing.
3	Develop an adaptative management plan.	a.	Fully assess the risks associated with mitigative actions using information collected.
		b.	Make recommendation for implementation of mitigation action(s).
		c.	Develop an implementation,

			evaluation and monitoring plan.
4	Restore population to provide an annual sustainable harvest of 5 kg/ha/yr.	a.	Implementation of mitigative action(s). Evaluate and monitor effectiveness of action(s) by quantifying changes in population.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	10/1995	12/1996	5
2	01/1996	12/2001	45
3	06/2001	12/2001	5
4	01/2002		45
		Total	100

Schedule constraints.

The first three objectives reflects a phase of the projected that the next phases is dependent upon. The Biological Risk Assessment (Objective 1) has been completed and identified data currently being collected (Objective 2). Completion of an Adaptive Management Plan (scheduled for completion in 2001 and implementation in 2001) is dependent on the collection of this data.

Objective 1 (Assessment Phase):

Milestone: 12/1996 -The identification of data concerning the Snake River sturgeon population that is need before potential mitigative actions designed to restore and protect the population can be fully assessed. Completion of Biological Risk Assessment (see Crimichael *et al.* 1997).

12/1997 - Completion of multi-year research plan designed to collect specific data concerning the status and health of the population, and identify and define habitat use by larval, young-of-the-year (YOY), juvenile, adult and spawning adult sturgeon as identified by the Risk Assessment (see Hoefs 1997).

Objective 2 (Data Collection Phase):

Milestone: 12/2001 -Final report assessing current status and health of the population and identifying habitat used and needs for spawning and rearing .

Objective 3 (Reassessment Phase):

Milestone: 12/2001 - Completion of an adaptive management plan designed to: a) reassess the risks associated with implementation of identified mitigative actions using data collected above, b) recommend need mitigative action(s) to achieve goal to restore sturgeon population, and c) monitor and evaluate effects of mitigative action(s) on population.

Objective 4 (Implementation/ Monitoring and Evaluation Phase):

Milestone: 01/2002 -Implementation of mitigative action(s) designed to restore population identified in the Adaptative Management Plan. Implementation of monitoring and evaluation program designed in Adaptive Management Plan.

Completion date. Enter the last year that the project is expected to require funding.

Objective 1: *Assessment Phase* -- Completed 12/1996
Objective 2: *Data Collection Phase* -- Scheduled for completion 12/2001
Objective 3: *Development of Management Plan* -- Scheduled for completion 12/2001
Objective 4: *Implementation* / *Monitoring and Evaluation Phase*
-- Projected* Completion Target for 12/2017
*(duration and extent of Implementation and M&E phase will depend on the type of mitigation actions identified as needed in the Adaptive Management Plan)

Section 5. Budget

FY99 budget by line item

Item	**Note**	**FY99**
Personnel	Project Leader Assistant Project Leader Field Crew Supervisor 4 Biological Aides	130,000
Fringe benefits	(27%) medical/retirement/other	35,100
Supplies, materials, non-expendable property	Field and office supplies and materials (Hooks, ropes, radio and sonic tags, nets, bait, paper, data books, buoys, anchors, etc.)	25,000
Operations & maintenance	Boat and vehicle operations and maintenance, Office utilities and rent, communications	45,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	N/A	0
PIT tags	# of tags:	0
Travel	Field per diem; lodging, airfare, per diem to regional and professional meetings, training, etc.	25,750
Indirect costs	(29.5%)	109,150
Subcontracts	Air support for tracking radio of fish	30,000
Other		

TOTAL		400,000

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	412,000	425,000	650,000	500,000
O&M as % of total	10%	10%	10%	10%

Section 6. Abstract

The goal of the NPT White Sturgeon Program is to restore and rebuild the white sturgeon populations in the Snake River between Hells Canyon and Lower Granite dams to support a sustainable annual subsistence harvest of white sturgeon by the Nez Perce People equivalent to 5 kg/ha/yr. This Project addresses measure 10.4A.4 of the Northwest Power Planning Council Fish and Wildlife Program to "...fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams." In 1996, a biological assessment of the upper Snake River white sturgeon was conducted by the Nez Perce Tribe (NPT) as part of BPA Project #86-50. The *Upper Snake River White Sturgeon Biological Assessment* was successful in identifying: 1) regional sturgeon management objectives, and 2) potential mitigation actions needed to restore and protect the population. However, the risks and uncertainties associated with their implementation could not be fully assessed because critical data concerning the status of the population and their habitat requirements are unknown. Currently, under BPA Project #97-09, NPT these data are being collected. From these data an adaptive management plan will be developed that will 1) reassess potential mitigative actions, 2) recommend the implementation of needed mitigative action(s), and 3) present a monitoring and evaluation plan.

Section 7. Project description

a. Technical and/or scientific background.

Development of the Columbia River Basin hydroelectric system has created impoundments throughout the basin that have altered habitat and the movement of white sturgeon and their principal food sources in the Lower Snake River subbasin between Hells Canyon and Lower Granite dam. As a result, it is hypothesized: 1) that natural production of white sturgeon is less than what it was before development and operation of the hydropower system, 2) that white sturgeon rearing habitat in many area is underseeded because of the reduction in spawning habitat caused by the hydropower system development and operations, 3) that white sturgeon production can be significantly enhanced by some combination of spawning and rearing habitat restoration and supplementation, and 4) that naturally spawning white sturgeon populations can be preserved and optimum rates of production can be restored while concurrently maintaining conservative tribal and recreational fishing opportunities (CBFWA 1997). However, the data to fully assess these hypotheses, or critical assumptions concerning the Snake River white sturgeon population between Hells Canyon and Lower Granite dams is not available (Carmichael *et al.* 1997).

Traditionally, the Nez Perce People harvested Snake River white sturgeon for subsistence purposes. However, subsistence fishing has been severely limited as a result of low sturgeon numbers. The objective of the NPT White Sturgeon Program is to identify means to restore and rebuild the Snake River white sturgeon population between Hells Canyon and Lower Granite dams in order to support a sustainable annual subsistence harvest of white sturgeon by the Nez Perce People equivalent to 5 kg/ha/yr (CBFWA 1997). It is our position that if no mitigative action is taken this goal will not be achieved. If this population is to be restored, we feel that scientifically sound mitigative actions or management strategies need to be applied.

In order to accomplish this objective NPT began a multi-year research effort to address measure 10.4A.4 of the Northwest Power Planning Council's Fish and Wildlife Program (NPPC 1994) to "...fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams". In 1995, during the first phase of this project a biological risk assessment team (BRAT) was assembled to develop a risk assessment for white sturgeon in the Upper Snake River between Hells Canyon and Lower Granite dams. BRAT participants included a wide range of professionals from a variety of federal, state, and private agencies that were knowledgeable and concerned about white sturgeon ecology, the Snake River system, and regional ecological issues. The *Upper Snake River White Sturgeon Biological Assessment* (Carmichael *et al.* 1997) was successful in identifying: 1) regional white sturgeon resource objectives, and 2) potential mitigative actions that could be used to achieve regional objectives.

A wide variety of potential mitigative actions that could be applied to restore the population was identified by the BRAT. Potential actions dealt with: 1) restoration and supplementation of sturgeon food resources, 2) alteration of flows from Hells Canyon, 3) reduction of contaminants in Lower Granite Reservoir, 4) identification and reduction of impacts of the catch-and-release fishery, 5) supplementation, and 6) reservoir drawdown.

The risks associated with the implementation of these actions, as well as a no action alternative, were analyzed using a risk assessment process (Lestelle *et al.* 1996). However, because of the lack of basic information concerning the white sturgeon in the Snake River between Hells Canyon and Lower Granite dams, the BRAT was not able to fully assess the risks and effectiveness of individual mitigative actions in restoring the population . The BRAT indicated that basic information concerning the current health and status of the population and habitat use by white sturgeon is need before the effectiveness of potential mitigative actions can be fully assessed. Without this information critical uncertainties exist concerning rearing and spawning habitat, how rearing and spawning habitat is affected by hydropower, whether the population is currently at equilibrium or if the system is at carrying capacity, and how population dynamics of white sturgeon have been affected by isolation. This lack of information prevents us from fully assessing the need for supplementation, alterations in hydropower operations, habitat restoration, restoration of natural food resources or whether no action is needed.

b. Proposal objectives.

Objective 1: Evaluate the need and identify potential actions for protecting and restoring populations to mitigate for effects of hydropower on white sturgeon productivity. Task 1 Conduct a Biological Risk Assessment to: a) identify potential mitigative actions, and b) assess risks and uncertainties that may result from their implementation.

Assumptions: 1) White sturgeon productivity has been affected by the development of the hydropower system. 2) White sturgeon population can be significantly enhanced by some combination of mitigative actions (i.e., spawning and rearing habitat restoration, supplementation.

Hypothesis: Existing data concerning the health, status and dynamics of the Snake River sturgeon population between Hells Canyon and Lower Granite dams is adequate to identify potential measures for protection and enhancing population and mitigating for effects of hydropower system.

Products: *The Upper Snake River White Sturgeon Biological Risk Assessment* (Carmichael *et al.* 1997). Identification of critical uncertainties concerning Snake River white sturgeon population that is needed before risks of potential mitigative actions can be fully assessed. *Multi-Year White Sturgeon Research Plan* (Hoefs 1997). Development of multi-year research designed to collect identified data

Objective 2: Collection of data needed to resolve critical uncertainties and fully assess potential mitigative actions.

Task 1 Assess health and status of population: a) estimate population abundance and structure, b) collect population data for modeling production and viability of the population.

Assumption: Natural production, recruitment and growth of white sturgeon is less than what it was before development and operation of the hydropower system.

Hypothesis: Size, structure and dynamics of the population vary spatially and temporally depending on flow conditions.

Product: Research Report summarizing the current health and status of the white sturgeon population (i.e., an estimate of abundance, distribution/ movements of various size/age classes of sturgeon throughout the system, various life history and population dynamics).

Task 2 Define use and evaluate habitat for spawning and rearing a) identify and define spawning habitat and behavior, b) identify 'nursery' habitat used by larval and YOY sturgeon, c) identify habitat used by adult and juvenile sturgeon

Assumption: White sturgeon densities are underseeded because of the reduction in spawning and rearing habitat caused by the hydropower system development and operations.

Hypotheses: Habitat use for larval, YOY, juveniles, adults and spawning adults differ and is a function of flow and flow related environmental conditions.

Product: Identification and characterization habitat used for spawning and rearing used by white sturgeon between Hells Canyon and Lower Granite Dams.

Objective 3: Develop an adaptative management plan that: a) reassess the risks associated with mitigative actions using information collected, b) makes recommendation for implementation of needed mitigation action(s), and c) develops a plan to implement, evaluate and monitor

Assumption: White sturgeon population can be significantly enhanced by some combination of mitigative actions (i.e., spawning and rearing habitat restoration, supplementation.

Hypothesis: The data collected concerning the current health, status and dynamics of the Snake River sturgeon population and habitat use between Hells Canyon and Lower Granite dams is adequate to identify potential measures for protection and enhancing population and mitigating for effects of hydropower system.

Product: Adaptative Management Plan.

Objective 4: Experimental implementation of mitigative action(s) to restore population to provide an annual sustainable harvest of 5 kg/ha/yr.

Assumption: White Sturgeon populations can be preserved and optimum rates of production can be restored while concurrently maintaining conservative tribal and recreational fishing opportunities

Hypothesis: Changes in populations are due to implementation of mitigative action(s).

Product: Annual assessment of population recovery and re-adaption of management needs and plans to sustain white sturgeon harvest rates of 5 kg/ha/yr.

c. Rationale and significance to Regional Programs.

As indicated by the BRAT, little specific information is known about the white sturgeon population between Lower Granite and Hells Canyon dams. Currently, the size and structure of the white sturgeon population and how habitat is utilized by sturgeon for rearing and spawning in the Snake River and it's major tributaries between Hells Canyon and Lower Granite dam are unknown.

Between 1972 and 1976 the abundance, distribution, and movement of white sturgeon in the Snake River was assessed in Hells Canyon reach of the Snake River to aid in regional white sturgeon management (Coon *et al.* 1977). Between 8,200 and 12,250 white sturgeon were estimated to populate the Snake River between Lower Granite and Hells Canyon dams. From 1982-1984 a second population estimate was conducted (Lukens 1985). The total portion of the free-flowing portion of the Snake River between Hells Canyon Dam and Lewiston, ID a total population estimate of 3,955 sturgeon was calculated. Although the author found it difficult to draw any conclusions about changes in the white sturgeon population between 1972 and 1984, because of differences in the designs of these early studies, he did report a 14% increase in sturgeon between 91.5 and 182.8 cm (Lukens 1985). Although the difference was not statistically significant, the increase was attributed to the an increase of those age classes that were harvested before 1970. In 1990-9,1 the abundance and structure of the white sturgeon population in Lower Granite Reservoir was assessed (Lepla 1994). The population in Lower Granite Reservoir was estimated to be between 946 and 2166 sturgeon. Although the 1970's estimates done in the Hells Canyon reach of the Snake River were extrapolated for the Snake River system it is not possible, to make comparisons between this study and those done in the upper river. These studies also looked at the age/size structure of the population. In all cases, the population was found to be comprised largely of juvenile sturgeon < 91 cm (Coon *et al.* 1977, Lukens 1985, Lepla 1994).

A current estimate of the number and size/age structure of white sturgeon throughout the entire Snake River reach and its major tributaries will allow us to determine if there has been any significant change since the early 1970's. Direct comparisons between population estimates from the earlier studies and from the study we are proposing may be difficult, because of variation in study designs. We should, however, be able to assess changes in the age/size structure of the population structure between that found in 1970's and 1980's in the upper sections of the river and in early 1990's in the lower reservoir. There has been some suggestion that the white sturgeon population in the Hells Canyon Reach is slowly recovering and that ages classes that were impacted by recreational fishing before 1970 are improving. A better understanding of changes in the abundance and age/size structure of the population that have occurred over the last 30 years, and how fish are distributed throughout the study reach will allows us to begin to determine if the population is currently at equilibrium with respect to size and age structure, and possibly identify underutilized capacity. This information is critical in determining whether white sturgeon production can be significantly enhanced by some combination of mitigative actions, such as restoration of spawning and rearing habitat, supplementation, and hydropower configuration and operation, identified by the BRAT or if the no action alternative should be taken. The distribution of sturgeon, determined by comparing numbers and the population structure among the Snake River Hells Canyon, Salmon River, and Lower Granite Reservoir reaches and direct monitoring of habitat used for spawning and rearing will allow us to assess and understand the effects of hydropower releases and impoundments on the population.

Studies in Lower Granite Reservoir and impounded areas in the Lower Columbia Basin found that less than 30 percent of the variation in sturgeon distributions were attributable to environmental factors (Lepla 1994, Parsley *et al.* 1993, Parsley and Beckman 1994). Little information concerning the effects of environment factors, however, is available in free-flowing river systems. Relationships between abundance and environmental factors, or habitat use in the free-flowing Salmon River, and comparisons with sections affected by daily water level fluctuations may give us a better understanding of habitat needs of different white sturgeon life stages and allow us to identify environmental factors limiting capacity and bottlenecks on white sturgeon productivity.

There are other factors that can affect the abundance and distribution of white sturgeon in the system. The construction of dams on the Columbia system has not only blocked the movement of white sturgeon, but also affected the influx of food resources. Lamprey and salmonids, the primary foods of large sturgeon in this areas once abundant in the Snake, Salmon and Clearwater Rivers, have all but been eliminated. As a result, it has been suggested that food may be limiting and thus affecting recovery of the white sturgeon population (Carmichael *et al.* 1997) By assessing the condition and health of the fish and determining age specific growth rates we hope to determine if there is a need to assess food habitats and food availability in the system. There is little information on what large white sturgeon are feeding on and whether food availability is affecting the size, structure and/or distribution of white sturgeon in this section of the Snake River.

Various population models have been used to assess population viability of white sturgeon in the Columbia and Snake River basins (Cochnauer 1983, Lukens 1985, Rieman and Beamesderfer 1990, DeVore *et al.* 1993) and are currently being developed specifically for the Snake River (IPC 1997). Collection of basic population dynamics data on the sex ratio of potential spawners, mortality by age, age of maturity, and spawning periodicity for females within the Snake River between Hells Canyon and Lower Granite dams will allow us to refine and apply these models to conditions specific to the study area. By modeling age-specific population information, changes in the population over time can be predicted or simulated under different situations. These models will be used to help assess the probable affects of potential mitigative actions on the white sturgeon population.

d. Project history

In 1995 the NPT White Sturgeon Project began as a sub-contact of BPA Project # 8605000 coordinated by Oregon Department Fish and Wildlife assessing the white sturgeon productivity, status and habitat requirements in the Snake and Columbia River basins. In 1997 the project (BPA Project # 9700900) was moved under the Nez Perce Umbrella Agreement.

Quarterly reports have been used to document monthly progress. In 1996 the annual report summarized the findings of the draft BRAT report and outlined initial data collection for 1997. In 1997, the *Upper Snake River White Sturgeon Biological Risk Assessment* (Carmichael *et al.* 1997) which identified potential mitigation actions and the data needed to fully assess their effectiveness and risk, and a *NPT Multi-Year White Sturgeon Research Program* (Hoefs 1997) which outlined a plan to collect the information identified by the BRAT were completed.

BPA funding for FY95-96 approximated $246,000 (under subcontract to the BPA White Sturgeon Project # 8605000). The NPT White Sturgeon BPA # 9700900 was funded $258,106 in 1997, and $390,000 in 1998, to complete and implement a plan to collection data identified by the BRAT, respectively.

To date the first phase of the project has been completed. The *Upper Snake River White Sturgeon Biological Risk Assessment* (Carmichael *et al.* 1997) and a *NPT Multi-Year White Sturgeon Research Program* (Hoefs 1997) have been completed. The second phase of the project, implementing the collection of data began in 1997. In 1997 approximately 250 sturgeon were captured, marked and population data measured from the Snake River between Lower Granite and the confluence of the Salmon River to begin assessment of the status and structure of the population. Plans for 1998, include expanding the area surveyed to include the Salmon River, and identifying spawning and rearing habitat.

e. Methods.

To complete the data collection phase of the project (Objective 2) white sturgeon will be captured throughout the Snake River and it's major tributaries to estimate the size of the Snake River white sturgeon population, assess movements and the population structure, and collect and model their population dynamics (Task 1). Rearing and spawning habitats will be identified either locating of areas with high densities of individuals and/or by tracking fish of various age classes (Task 2).

To estimate the size of the population mark-recapture estimators will be used (Ricker 1975, Otis *et al.* 1978. White *et al.* 1982). Sampling will be randomized by reach and designed so data collected can be used to test whether sturgeon are emigrating or migrating between reaches within the Snake River and or it's tributaries (the Salmon and Clearwater Rivers) defining populations of interest. The program Capture (Otis *et al.* 1978) will be used to estimate the population size using a variety of capture/recapture models (including the Jolly-Seber open population model), test the assumptions of each, and determine which model is most appropriate (White *et al.* 1982). The white sturgeon population will be estimated (with 95 percent confidence intervals) throughout the study area, in individual reaches, and for various size/age class.

Sturgeon that are being captured and marked to estimate the size of the population size will also be used to collect information on movement and the age/size structure of the population throughout the study area, and collect population dynamic data. All captured fish will be measured and weighted. In addition, a proportion of the sturgeon from a variety of size classes will be aged by clipping a section of the pectoral fin and counting annual ring formations (Cuerrier 1951, Nigro 1989, Rien and Beamesderfer 1993, Tracy and Wall 1993). Sturgeon > 150 cm will be sexed by making a small incision (1.5 -2 cm) along the side of the abdomen. Gonad tissue will be removed through this incision and used to determine sex and maturity (Conte *et al.* 1988). Population age/size structure will be evaluated throughout the Snake River system and within individual reaches and habitats of interest.

Population dynamic parameters will be needed for modeling productivity and viability of the population. Sex and age structure will be used for modeling productivity. Catch curves, generated by plotting the number of fish at each age, will be used to determine instantaneous mortality rates (the regression slope of the descending limb; Ricker 1975). Growth rates will be determined from recapture data using fish marked during the duration of this study and data on fish that have been previously been marked.

Recapture data collected over the next five years from a variety of age classes will allow us to determine age class specific growth rates and test growth rate estimates that have been derived in the past.

In addition, condition of sturgeon captured will determined by fitting the relationship between fork length (l) and weight (W), $W=a\, l^{b}$ and comparing it to other Snake and Columbia River populations using the standard weight equation (Ws = 2.735E-06FL3.232; Beamesderfer 1993). Condition will be compared among reaches within the study area and with other Columbia River white sturgeon populations. Water depth, water column velocity and turbulence, and substrate characteristics will be measured at each sampling location.

Rearing and spawning habitats will be identified either locating of areas with high densities of individuals and/or by tracking fish of various age classes (Task 2). Gravid females and potentially spawning males will be tagged with radio and sonic transmitters (Apperson and Anders 1990) and spawning behavior and habitat will be monitored in the Snake River and it's major tributaries to identify rearing and spawning habitat use by white sturgeon. Similarly, movement and habitat use of juvenile and adult white sturgeon of various size classes will be monitored. The distribution of larvae and YOY throughout the area will also be determined and of high fish densities used to reflect habitat selection.

At least 20 sturgeon, including 5 potential spawning females (late vitellogenic egg stage; Beer 1981) will tag with radio and sonic transmitters each year. Tagged sturgeon will initially be located once a week, through triangulation, using yagi antenna and/or a hydrophone with a Lotek SRX 400 receiver adapted to receive sonic signals. The frequency of locations may be increased depending on the variability and patterns of habitat use and movement. In addition to the environmental variables described above, temperature at potential spawning sites will be monitored using thermographs. Discharge patterns will also be monitored. Egg mats will also be placed downstream from where spawners stage and checked periodically for eggs (McCabe 1990). Collected eggs will be preserved and developmental stage determined (Beer 1981). Developmental stage will be used estimate date of spawning and determine pre-spawning environmental conditions that may influence spawning.

Densities of larval and YOY the year fish will assessed throughout the study area. Initially suspected "nursery' areas will be targeted for larval and YOY using plankton nets and small mesh nets, respectively. Habitat use of larval fish and YOY will be estimated using multivariate models that correlate densities of fish at a location with environmental factors.

An adaptative management plan, based on these data will then be written and implemented. The adaptative management plan will 1) assess the risks and uncertainties associated with potential mitigative actions using a risk assessment process (Lestelle *et al.* 1996), 2) make recommendations to implement mitigative actions designed to restore and rebuild the white sturgeon population to obtain a sustainable annual tribal subsistence harvest of 5 kg/ha/yr (CBFWA 1997), and 3) present a plan to implement, evaluate and monitor of effects of the mitigation action on the population.

f. Facilities and equipment.

Office and storage space is provided by the Nez Perce Tribe at the Orofino Field Office, Orofino, ID and at the NPT White Sturgeon Experimental Production Facility in Clarkston WA. Non-expendable field and office items (boats, computers, sampling gear, etc.) needed to complete the project as outlined for sampling have previously been purchased in 1996 and 1997. In addition, sampling gear and boats are available on loan from other Tribal Projects supported under the BPA Umbrella Agreement with the NPT Tribe Fisheries Department. Annual costs to operate and maintain GSA vehicles are include in each years budget projections.

g. References.

Apperson, K. and P.J. Anders. 1990. Kootenai River white sturgeon investigations and experimental culture. Annual Progress Report FY 1989. Idaho Department of Fish and Game and Bonneville Power Administration. Contract Number DE-A179-88BP93497 / Project 88-65. Portland, OR.

Beamesderfer, R.C. 1993. A standard weight (W_s) equation for white sturgeon. *in* R.C. Beamesderfer and A.A. Nigro (*editors*). Status and Habitat requirements of white sturgeon populations in the Columbia River downstream fro McNary Dam, Volume II. Final Report (Contract DE-A179-86BP63538) to Bonneville Power Administration, Portland, OR.

Beer, K.E. 1981. Embryonic and larval development of white sturgeon (*Acipenser transmontanus*). M.S. Thesis. University of California. Davis, CA.

Carmichael, R., L. Lestelle, L. Mobrand, D. Statler, R. Carter, D. Bennett, J. Chandler, K. Lepla, T. Cochnauer, J. DeVore, T. Rien, R. McMullin, M. J. Parsley, and A. Seamans. 1997. Upper Snake River White Sturgeon Biological Risk Assessment. Prepared for Nez Perce Tribe by Mobrand Biometrics Inc. Vashon Island, WA.

Columbia Basin Fish and Wildlife Authority. 1997. Draft Multi-year implementation plan for resident fish protection, enhancement and mitigation in the Columbia River Basin. CBFWA Tech. Planning Document. Portland, OR.

Cochnauer, T.G. 1983. Abundance, distribution, growth and management of white sturgeon (Acipenser transmontanus) in the middle Snake River, Idaho. Doctoral Dissertation. University of Idaho. Moscow, ID.

Conte, F.S., S.I. Doroshov, P.B. Lutes, and E.M. Strange. 1988. Hatchery manual for the white sturgeon Acipenser transmontanus with application to other North American Acipenseridae. Cooperative Extension, University of California, Division of Aguaculture and Natural Resources, Publication 3322. Davis, CA.

Coon, J.C. and R.R. Ringe, and T.C. Bjornn. 1977. Abundance, growth and movements of white sturgeon in the mid-snake river. Research Technical Completion Report Project B-026-IDA. Idaho Water Resources Research Institute. University of Idaho. Moscow, ID.

Cuerrier, J.P. 1951. The use of pectoral fin rays for determining age of sturgeon and other species of fish. Can. Fish Cult. 11:10-18.

DeVore, J.D., B.W. James, C.A. Tracy, and D.H. Hale. 1993. Dynamics and potential production of white sturgeon in Columbia River downstream from Bonneville Dam. *in* R.C. Beamesderfer and A.A. Nigro (*editors*). Status and Habitat requirements of white sturgeon populations in the Columbia River downstream fro McNary Dam, Volume II. Final Report (Contract DE-A179-86BP63538) to Bonneville Power Administration, Portland, OR.

Hoefs, N.J. 1997. NPT White Sturgeon Multi-Year Research Plan. Nez Perce Tribe Report. Lapwai, ID

Idaho Power Company. 1997. Status and habitat use of white sturgeon in the Hells Canyon Complex. Formal Consultation Package fro Relicensing. Hells Canyon Project, FERC no. 1971. Volume 1. Idaho Power Company. Boise, ID.

Lepla, K.B. 1994. White sturgeon abundance and associated habitat in Lower Granite Reservoir, Washington. Thesis. University of Idaho. Moscow, ID.

Lestelle, L.C., L.E/ Mobrand, J.A. Lichatowich, T.S. Vogel. 1996. Ecosystem diagnosis and treatment (EDT) Applied Ecosystem Analysis- A Primer. BPA Department of Fish and Wildlife. Portland, OR

Lukens, J.R. 1985. Hells Canyon White Sturgeon Investigations. Idaho Department of Fish and Game, River and Stream investigations, Job Performance Report, Project No. F-73-R-7. Idaho Fish and Game, Boise, ID.

McCabe, G.T. 1990. Use of an artificial substrate to collect white sturgeon eggs. Calif. Fish and Game 76:248-250.

Nigro, A.A. 1989. Columbia River Research Programs. *in* Pacific States Marine Fisheries Commission 1989 White Sturgeon Workshop Proceedings. *Abstract.* Pacific States Marine Fisheries Commission. Portland, Oregon.

Northwest Power Planning Council. 1994. Columbia River Basin Fish and Wildlife Program. Report 94-48; NPPC. Portland Oregon.

Otis, D.L., K.P. Burnham, G.C. White and D.R. Anderson. 1978. Statistical inference from capture data on closed animal populations. Wildlife Monographs 62

Parsley, M.J and L.G. Beckman. 1994. White Sturgeon Spawning and Rearing Habitat in the Lower Columbia River. North American Journal of Fisheries Management 14:812-827.

Parsley, M.J , L.G. Beckman, and G.T. McCabe, Jr. 1993. Spawning and rearing habitat used by White sturgeon in the Columbia River Downstream from McNary Dam. Transactions of American Fisheries Society 122:217-227.

Pacific States Marine Fisheries Commission.1992. White sturgeon management framework plan. PSMFC, Portland, OR.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin 191. Fisheries Research Board of Canada.

Rieman, B.E. and R.C. Beamesderfer. 1990. White sturgeon in the lower Columbia River: is the stock overexploited? North American Journal of Fisheries Management 12:255-265.

Rien, T.A., and R.C. Beamesderfer. 1993. Accuracy and precision in age estimates of white sturgeon using pectoral fin-rays. in R.C. Beamesderfer and A.A. Nigro, (eds.) Status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam, volume II. Final Report (Contract DE-AI79-86BP63584) to Bonneville Power Administration, Portland, OR.

Tracy, C.A. and M.F. Wall. 1993. Length at age relationships for white sturgeon in the Columbia River downstream from Bonneville Dam. in R.C. Beamesderfer and A.A. Nigro, (eds.) Status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam, volume II. Final Report (Contract DE-AI79-86BP63584) to Bonneville Power Administration, Portland, OR.

White, G.C., D.R. Anderson, K.P. Burnham, and D.L. Otis. 1982 Capture-recapture and removal method for sampling closed populations. Wildlife Monograph 62.

Section 8. Relationships to other projects

BPA 8605000- *White Sturgeon Productivity Status and Habitat Requirements*

The 8605000 project was designed as an cooperative effort among the agencies involved in restoration and enhancement of white sturgeon populations in the Columbia and Snake River basins. Initial assessment of the Snake River white sturgeon between Hells Canyon and Lower Granite dams by NPT was conducted as part of the this project.

This project has provided the framework and techniques for assessment of the health and status and identification white sturgeon habitat used for spawning and rearing. Although, NPT White Sturgeon Project is now included under the BPA Umbrella Agreement the Tribe has continued its involvement with the 8605000 Project as a member of the Columbia Basin White Sturgeon Cooperators Group.

Idaho Power Company, *Hells Canyon Relicensing Project FERC No. 1971*

Concurrent with the work being done by NPT, Idaho Power Company (IPC) is assessing the status and habitat use of white sturgeon in the Hells Canyon Reach of the Snake River (IPC 1997). Because of the similarity in the objectives and tasks being assessed, if a formal agreement can be reached to share data the majority of the work proposed by NPT will be conducted on the Snake River below the mouth of the Salmon River. Randomized sampling conducted to estimate the size of the population will not include the Snake River reaches above the mouth of the Salmon River. Tracking and assessment of spawning and rearing habitat will be conducted throughout the study area, including the Snake River reach above the mouth of the Salmon River. However, further coordination with IPC is planned to reduce duplication in defining and identifying spawning and rearing habitat throughout the Hells Canyon section of the Snake River.

Section 9. Key personnel

<u>Vacant, Project Leader/Research Biologist (12 Months):</u>. Design, implementation, and coordination of white sturgeon research studies. Oversight, management and supervision of White Sturgeon Research Program. Senior negotiator among regional and national fisheries agencies concerning all aspects of White Sturgeon Research Program. Prepares and finalizes all scientific and technical reports and publications including the generation and submission of quarterly and annual reports. Responsible for development and design of research plans, and preparation of budgets.

<u>Vacant, Assistant Project Leader/Biologist (12 Months):</u> Responsible for collection and processing of scientific data. Assist in the preparation of scientific and technical reports and publications including the generation and submission of quarterly and annual reports. Supervision of Field Crew Supervisor and field operations.

<u>Brad Picard, Field Crew Supervisor:</u> Oversight, management and supervision of white sturgeon field research operations. Includes sampling and processing of white sturgeon throughout the Snake, Salmon and Clearwater River. Responsible for maintaining equipment determined needed to meet field research needs. Direct and oversee field operations and supervise field crews.

<u>Biological Aides (12 Month):</u> Carry out field tasks as assigned. Responsible for the collection and integrity of data under supervision of Project Leader, Assistant Project Leader, and Field Crew Supervisors.

Section 10. Information/technology transfer

Information collected will be analyzed and presented in annual reports to BPA and peer-reviewed journals, and at regional and national scientific meetings, BPA reviews, and at meetings of the Columbia River Sturgeon Cooperators Group.   Recommendations for restoration, plans for implementation, evaluation and monitoring will be reported in an Adaptative Management Plan.